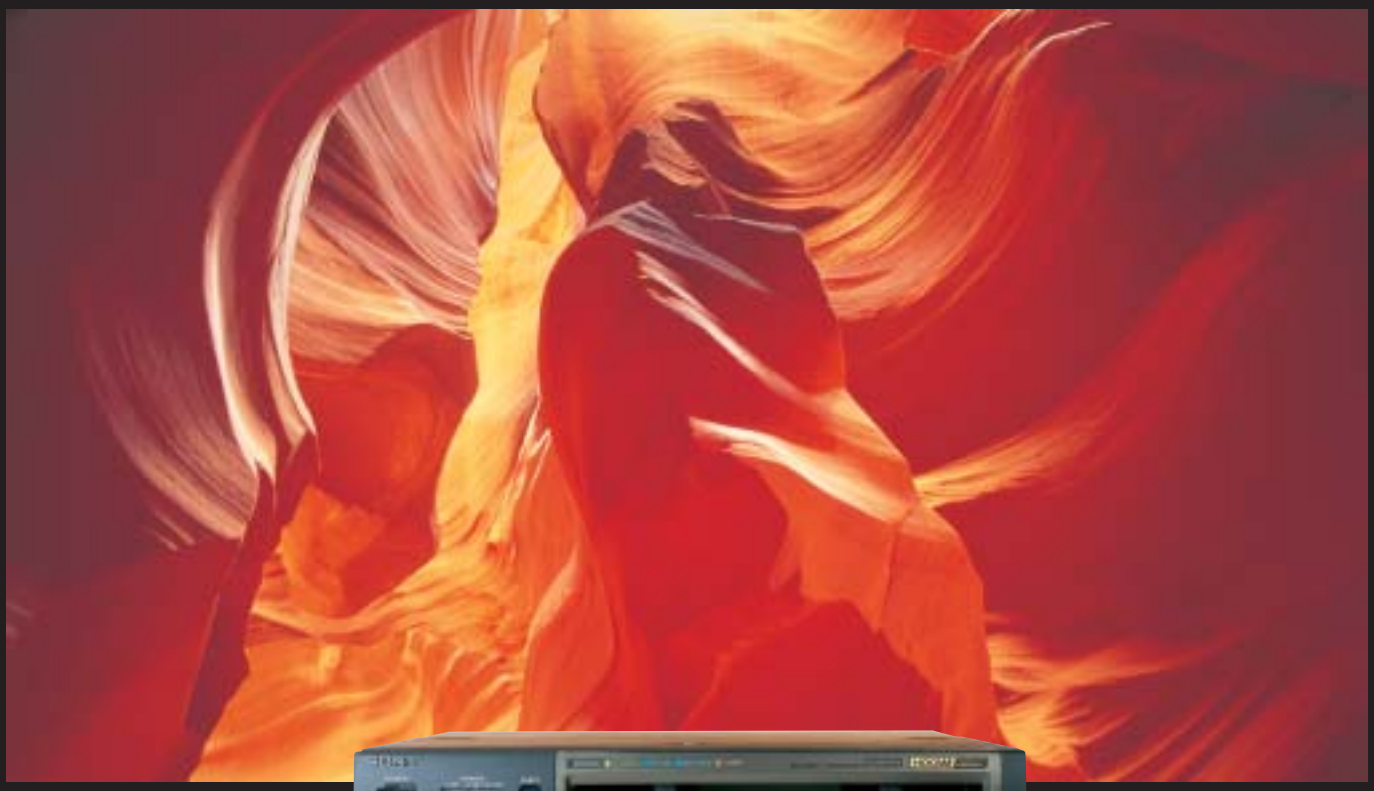
SONY

CINE ALTA™

HDCAM™



Sony Digital Recorder and Player

HDW-2000 Series

HDCAM Studio VTRs with 24P-Recording/Playback Ca

pabilities – A Versatile Workhorse for HD Programming

Since introducing its first model in 1997, Sony has enhanced the HDCAM™ Series of products, continually reinforcing its support to the emerging DTV agendas around the world. Followed by the introduction of the HDW-F900 multi-frame rate camcorder and its companion HDW-F500 VTR, HDCAM products have revolutionized the world of movie-making, now popularly recognized by the name CineAlta™.

With the rapid proliferation of HD in video productions, Sony introduced its second generation of HDCAM products, the HDW-2000 Series VTR and its counterpart HDW-750 camcorder. These models continue to present a cost-effective and feature-enhanced HD solution, focused on streamlining the migration process to full DTV operations.

In response to the ever-increasing demands for 24P-based HD program origination in various video production applications – especially movie-making – the HDW-2000 Series has been further evolved by accommodating the ability to record at the frame rates of 23.98PsF and 24PsF, serving as a cost-effective entrance to CineAlta operations. Furthermore, the capability to output the converted 720P signals has also been added for more flexible operation. The HDW-2000 Series also includes other invaluable functions such as legacy playback of standard-definition BETACAM™ formats and internal up-/down-conversion* capabilities. This highly versatile playback capability is crucial for bi-directional exchange of program material between co-existing SDTV and HDTV infrastructures, and for integration into a wide array of editing environments.

Sony has been continually improving its lineup of the HDW-2000 Series to allow users to select the most appropriate HDCAM VTR for their specific operational or budgetary needs. Four types of recorder and one type of player are available in a wide, yet affordable price range, each offering a different combination of Betacam format playback capabilities. All of these products can operate in multiple modes including 59.94i, 50i, 29.97PsF, 25PsF, 24PsF, and 23.98PsF.

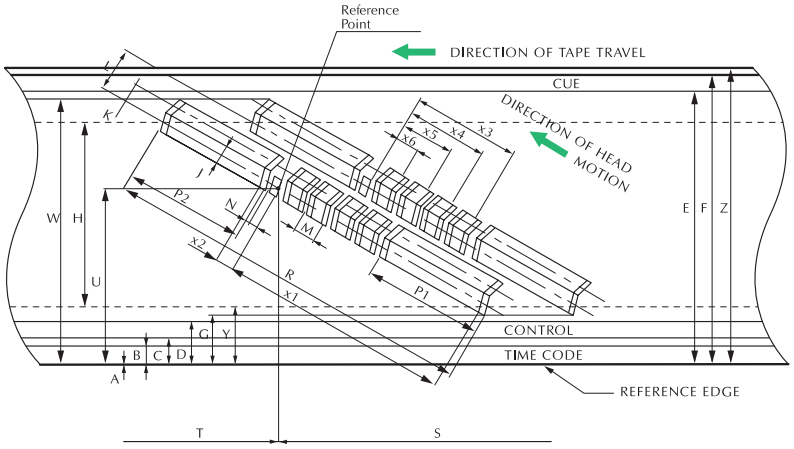
With a rich choice of models, and the high quality and operability that the HDCAM format is renowned for, the HDW-2000 Series VTR offers an economically well-balanced solution for HD programming.

* Down-conversion is not available for tapes played back at 23.98 and 24 frames.

Features

High-Definition Picture Quality with HDCAM Format

The HDW-2000 Series recorders/player adopt the proven HDCAM format, recording high-definition component digital signals using the state-of-the-art HDCAM compression technology. This excellent compression scheme maintains a high video bit rate of 140 Mb/s (data rate on tape of 185 Mb/s). The format combines superb picture quality with the high reliability and robustness of 1/2-inch tape integrated into a design approach inherited from the BETACAM Series.

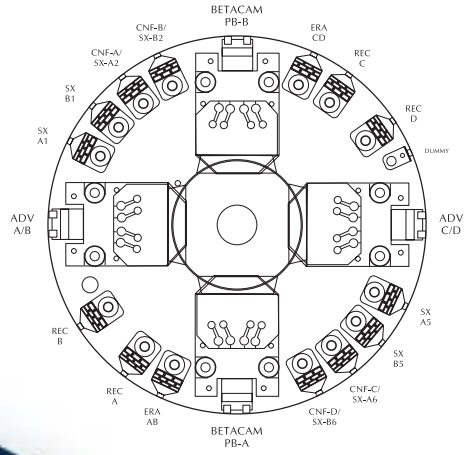


Compact, Affordable High-Definition Video Cassette Recorder/Player with Legacy Playback

The HDW-2000 Series high-definition VTRs are not only affordable, they also provide a smooth migration path into the HDTV world. Five different models are available to suit budgetary and operational needs. In addition to HDCAM recording/playback, the HDW-2000 Series VTRs are equipped with backward playback capability for current 1/2-inch tape formats*; Digital BETACAM, MPEG IMX, BETACAM SX, BETACAM SP and BETACAM. However, the HDW-2000 eliminates this capability in order to provide utmost cost efficiency. With its affordability and different choice of feature sets, the HDW-2000 Series is destined to be a true workhorse in broadcast stations and ENG applications.

* Playback-compatible formats vary by product.

HEAD POSITION



Drum Head Allocation

HDW-2000 Series Line-up

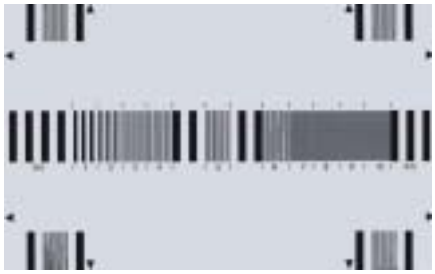
		Recording Format	Playback Format
HDW-2000	HD Digital Video Cassette Recorder	HDCAM	HDCAM
HDW-M2000 HDW-M2000P	HD Digital Video Cassette Recorder	HDCAM	HDCAM, Digital BETACAM, MPEG IMX, BETACAM SX, BETACAM SP, BETACAM
HDW-D2000	HD Digital Video Cassette Recorder	HDCAM	HDCAM, Digital BETACAM, MPEG IMX
HDW-S2000 HDW-S2000P	HD Digital Video Cassette Recorder	HDCAM	HDCAM, BETACAM SX, BETACAM SP, BETACAM
HDW-M2100 HDW-M2100P	HD Digital Video Cassette Player	——	HDCAM, Digital BETACAM, MPEG IMX, BETACAM SX, BETACAM SP, BETACAM

Built-in Up- and Down-Converters*

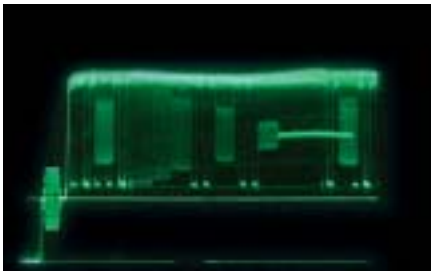
The HDW-2000 Series can playback a wide variety of legacy SDTV VTR formats in addition to the HDCAM format. Since the HDW-2000 Series can output signals in 1080i, 576i and 480i, each format is reproduced in its corresponding vertical resolution.

As an even greater advantage, the HDW-2000 Series has up and down converters built-in so a program originated for SDTV can be up converted for HDTV transmission, and materials that were made in the HD format can be down converted as "Super-sampled" SD images. This is a distinct advantage of the HDW-2000 Series. The "Super-sampled" HD origination produces standard definition 480 and 576-line NTSC/PAL signals which are superior to those originated in standard definition (their horizontal and vertical MTFs are higher and the associated scanning aliasing is less).

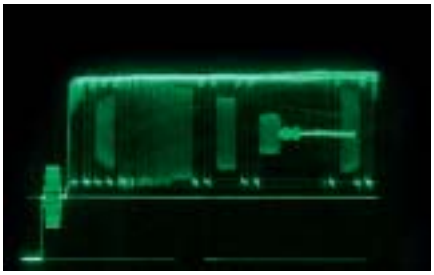
* Excludes the HDW-2000.



Multi-burst Chart



Conventional 480/576-line
Digital VTR



"Super-sampled" HDCAM
Down-Converted signals

Interlace, Progressive Switchable Operation including 24PsF Mode

The HDW-2000 Series recorders provide recording and playback capability of the HDCAM format in 1080/59.94i, 1080/50i, 1080/29.97PsF, and 1080/25PsF frame rates*1. The HDW-2000 Series also allows legacy playback of both 480/59.94i and 576/50i on the same deck*1. This flexibility makes it an extremely effective tool for international programming.

To meet the increasing needs of 24P program creation, 23.98PsF/24PsF recording is now available on all HDW-2000 Series recorders, as well as the ability to convert 23.98PsF/24PsF recordings to a 25PsF signal with the appropriate time-code conversion for 24P program creation*2. Furthermore, the full HDW-2000 Series lineup can output the converted 720/59.94P signal from the 59.94i or 29.97PsF playback, providing further enhanced flexibility.*2

*1 The frame rate of the source tape cannot be converted at the output between 1080/59.94i and 1080/50i or between 480/59.94i and 576/50i. Playback of a 576-line analog Betacam tape on the HDW-M2000/S2000/M2100 (NTSC model), and playback of a 480-line analog BETACAM tape on the HDW-M2000P/S2000P/M2100P (PAL model) is for monitoring purpose only.

*2 Requires audio pitch correction. Down conversion and/or "pull-down" of tapes played back at 23.98PsF or 24PsF frame rates are not provided.

Long Recording Time on a Single Cassette

Utilizing the HDCAM format's high-density recording capability and compression technology, the HDW-2000 Series provides a long maximum recording time of 124 minutes at 1080/59.94i, 149 minutes at 1080/50i, and 155 minutes at 1080/24PsF for each L cassette. Small size cassettes can also be used, which provides a maximum of 40 minutes of recording at 1080/59.94i, 48 minutes at 1080/50i, and 50 minutes at 1080/24PsF. This flexibility allows the HDW-2000 Series to cover a wide range of applications including news, sports, and production.

Digital Audio and Dolby®* Recording

The HDCAM format records four channels (two AES/EBU stereo pairs) of non-compressed digital audio (20 bit at 48 kHz). The HDW-2000 Series recorders can also record non-audio data streams within the audio recording area by packaging the data within an AES/EBU wrapper. Furthermore, the HDW-2000 recorders can record Dolby-E and Dolby AC-3 data (non-audio) streams on the audio tracks.

* Dolby and the double-D symbol are trademarks of Dolby Laboratories Inc.

Compact Design and Low Power Consumption

This Series features a compact 4RU-size* design and weighs only 23 kg (50 lb 11 oz) – 12 kg (26 lb 7 oz) lighter than the HDW-500 HD Video Recorder. It also has low power consumption of 220 W. This compactness and low power consumption are suited to not only studio use but also installation into OB-vans.

∗4RU size=427 x 174 x 540 mm (16 7/8 x 6 7/8 x 21 1/2 inches)

Versatile Interfaces

The HDW-2000 Series features a wide range of interfaces including;

- HD SDI I/O*
- SDI output (D1 component)
- SDTI I/O* (optional-requires HKDW-102 SDTI Interface Board)
- Analog Component output
- Analog Composite output (NTSC/PAL)
- Digital Audio I/O*(AES/EBU)
- Analog Audio I/O*
- Audio Monitor output (2-ch analog)

∗The HDW-M2100/M2100P player provides outputs only.

HDW-M2000

User-friendly Control Panel

Control panels are compact, yet comprehensive. There is a minimal learning curve since its design and functionality are inherited from universally used BETACAM SP VTRs. In addition, the control panel has a multi-function display that provides comprehensive information for quick access and easy control of a variety of functions. Dedicated control knobs and meter displays are included for each of the four audio channels.

Using the optional control panel HKDW-101, VTRs can be controlled from the same control panel simultaneously.

HKDW-101 Control Panel with BKMW-102 Case

Easy Maintenance

Most of the circuitry of the HDW-2000 Series is arranged on plug-in boards to allow quick and easy maintenance. The drum assembly has been designed to achieve simple, low-cost maintenance by adopting an upper drum mechanism and an auto adjustment function as used in MPEG IMX VTRs and BETACAM SX recorders. This helps to drastically reduce the time required for periodic drum replacement.

Operational Convenience

Frame Accurate Editing

The HDW-2000 Series recorders enable insert or assemble editing with frame accuracy. Each channel of video and audio signal is independently editable. It is possible to execute precise editing on HDCAM tapes in machine-to-machine or A/B roll configurations.

High Speed Color Picture Search

Recognizable color pictures are provided in shuttle mode at speeds up to ±50 times normal playback.

Dynamic Tracking™ Playback

A Dynamic Tracking playback capability provides high quality pictures over the range of -1 to +2 times normal playback speed during playback of HDCAM tapes, -1 to +3 times for BETACAM/BETACAM SP/MPEG IMX/Digital BETACAM tapes, -1 to +2 for BETACAM SX tapes.

Digital Jog Sound

Reproduction of four (eight for MPEG IMX) channels of digital audio is achieved, in the Jog mode. With a responsiveness and sound quality reminiscent of BETACAM SP machines, this feature is helpful in quickly and precisely establishing an editing point while monitoring the digital audio signals which remain in absolute sync with the pictures.

Audio Crossfade Function

As with all Sony half-inch professional formats, the HDW-2000 Series recorders feature Digital Audio Crossfade to achieve smooth audio transitions at audio insert edit points. Previously recorded audio signals are read in advance using Pre-read heads and then re-recorded onto the same track after being mixed with the input audio signal. The crossfade duration can be selected from a range of values.

Dynamic Motion Control (DMC) Playback

The HDW-2000 Series also provides a DMC playback capability, memorizing the tape speed trajectory over the DT speed range (-1 to +2 times normal speed).

Pre-read Editing

The HDW-2000 Series recorders are equipped with advanced playback heads to enable pre-read editing. This function allows application including titling with a single VTR, A/B-roll with two VTRs, as well as audio mix and channel swap.

1080/1035 Line Conversion

The HDW-2000 Series provides bi-directional vertical filtering between the two active line standards of 1080 and 1035 and enhanced quality of variable speed Dynamic Tracking playback as standard.

Shot Marks

The HDW-2000 Series recorders can scan tapes with Shot Marks and automatically detect their positions. After scanning, a list of all the marks is displayed on the video monitor, allowing easy cueing to any mark.

HDW-750 Series Menu

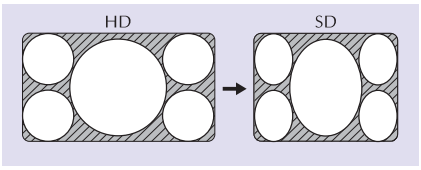
HDW-2000 Series Time Code List

HDW-750

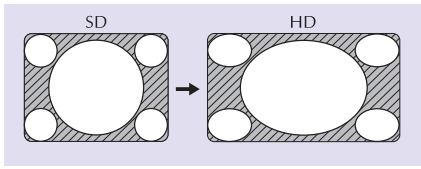
Selectable Picture Mode

Three modes of operation enable correct presentation, depending on the application required.

SQUEEZE mode

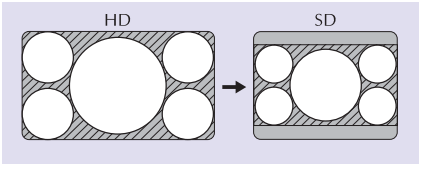


HD to SD, 16:9 HD picture is down-converted and output as a 4:3 SD picture.

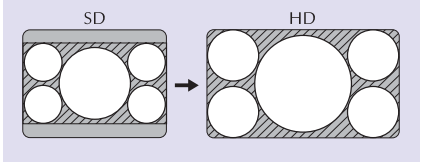


SD to HD, 4:3 SD picture is up-converted, then output as a 16:9 HD picture.

LETTER BOX mode

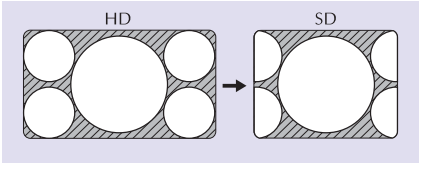


HD to SD, 16:9 HD picture down-converted to SD and output is presented in Letter-box on a 4:3 monitor.

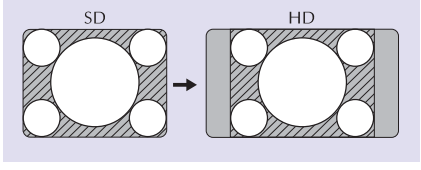


SD to HD, 4:3 SD picture is cropped and presented as a 16:9 picture.

EDGE CROP mode



HD to SD, edges of a 16:9 HD picture are cropped in the down-converted 4:3 SD picture.



SD to HD, 4:3 SD picture up-converted as a 16:9 HD picture, however the sides are cropped.

Metadata Handling

In the HDW-2000 Series, special care has been given to metadata handling in order to increase production efficiency, and to provide the utmost convenience in media asset management systems and material distribution systems. In general, metadata consists of user-defined data indicating when, where, or by whom the material was created, Closed Caption data, and a variety of other data describing the material content.

Among such metadata, UMID, as standardized in SMPTE 330M, is a globally unique identifier used for the identification of picture/audio material and data. UMID is automatically generated within compatible equipment such as VTRs and camcorders during each recording.

The HDW-2000 Series VTR provides the facility to record UMID on tape when the VTR performs dubbing, editing, and copying through up-/down-conversion. This recorded UMID is used in subsequent processes from editing, archiving and on to distribution, bringing efficiency throughout the entire program production chain.

The HDW-2000 Series VTRs enables up to 255 bytes x 3 packets of metadata per field to be recorded, which can be transferred to other devices via HD-SDI, or SDTI.

Optional Accessories

HKDW-101,
Control Panel

HKDW-102,
SDTI Interface Board

BKMW-102,
Remote Control Unit

BKMW-103,
Control Panel Extension Kit

RMM-131,
Rack Mount Kit

RCC-5G,
9-pin Remote Cable

RM-280,
Editing Controller

HKDV-900,
HD Digital Video Controller*

BCT-124HDL/64HDL/22HD,
HDCAM Tape Cassette

BCT-HD12CL,
Cleaning Cassette

BKNW-7000 Series MMStation™
Remote Monitoring and Maintenance Software

MLB-1M-100 Memory Label
(for Tele-File system)

*To connect the HKDV-900 with the HDW-2000 Series VTRs, the optional video controller cable, RCC-1505H/1510H/1530H is required.

HDW-2000 Series Specifications

			HDW-2000	HDW-M2000/M2000P	HDW-M2100/M2100P
General	Power requirements		100 to 240 V, 50/60 Hz		
	Power consumption		220 W		
	Operating temperature		+5 to +40 °C (41to 104 °F)		
	Storage temperature		-20 to +60 °C (-4 to +140 °F)		
	Humidity		25 to 90%		
	Mass		23 kg (50 lb 11 oz)		
	Dimensions (W x H x D)		427 x 174 x 544 mm (16 7/8 x 6 7/8 x 21 1/2 inches)		
	Tape speed	HDCAM	96.7 mm/s (59.94i, 29.97PsF), 80.6 mm/s (50i, 25PsF), 77.4 mm/s (24PsF, 23.98PsF)		
		Digital BETACAM	—	96.7 mm/s	
		MPEG IMX	—	64.5 mm/s (525/59.94), 53.8 mm (625/50)	
		BETACAM SX	—	59.6 mm/s	
		BETACAM/BETACAM SP	—	118.6 mm/s (525/59.94), 101.5 mm/s (625/50)	
	HDCAM record/playback time		124 minutes (59.94i, 29.97PsF, with BCT-124HDL cassette) 149 minutes (50i, 25PsF, with BCT-124HDL cassette) 155 minutes (24PsF, 23.98PsF, with BCT-124HDL cassette) 40 minutes (59.94i, 29.97PsF, with BCT-40HD cassette) 48 minutes (50i, 25PsF, with BCT-40HD cassette) 50 minutes (24PsF, 23.98PsF, with BCT-40HD cassette)		
	Fast forward/rewind time		Approx. 3 minutes (with BCT-124HDL cassette)		
	Search speed range	Shuttle mode			
		HDCAM	Still to ±50 times normal speed playback (59.94i, 29.97PsF), Still to ±58 times normal speed playback (50i, 25PsF), Still to ±60 times normal speed playback (24PsF, 23.98PsF)		
		Digital BETACAM	—	Still to ±50 times normal speed playback	
		MPEG IMX	—	Still to ±78 times normal speed playback	
		BETACAM SX	—	Still to ±78 times normal speed playback	
		BETACAM/BETACAM SP	—	Still to ±35 times normal speed playback (525/59.94) Still to ±42 times normal speed playback (625/50)	
		Variable mode			
		HDCAM	—	-1 to +2 times normal speed playback	
		Digital BETACAM	—	-1 to +3 times normal speed playback	
		MPEG IMX	—	-1 to +3 times normal speed playback	
		BETACAM SX	—	-1 to +2 times normal speed playback	
		BETACAM/BETACAM SP	—	-1 to +3 times normal speed playback	
		Jog mode	Still to ±1 times normal speed playback		
	Servo lock time		0.6 s or less (59.94i, 29.97PsF, from standby on), 0.7 s or less (50i, 25PsF, 24PsF, 23.98PsF, from standby on)		
	Load/unload time		6 s or less (both L and S cassettes)		
Input/output	HD-SDI input		BNC x 1 (SMPTE 292M), Serial Digital (1.485 Gb/s)		—
	SDTI input (with optional HKDW-102 installed)		BNC x 1 (SMPTE305M), 270 Mb/s		—
	Reference video input		BNC x 2 (with a loop-through), Tri-level sync, 0.6 Vp-p, 75 Ω, sync negative or Black Burst or Composite, 0.3 Vp-p, 75 Ω, sync negative		
	Digital audio input (CH 1/2, CH 3/4)		BNC x 2, AES/EBU		—
	Analog audio input (CH 1/2/3/4/Cue)		XLR-3-pin type, female, x 5 Low off: -60 dBu, high impedance, balanced High off: +4 dBu, high impedance, balanced High on: -4 dBm, 600 Ω termination, balanced		—
	Time code input		XLR-3-pin type, female, x 1 (0.5 to 18 Vp-p,10 kΩ, balanced)		
	HD-SDI output		BNC x 3 (SMPTE 292M including one character out), Serial Digital (1.485 Gb/s)		
	SDTI output (with optional HKDW-102 installed)		BNC x 2 (SMPTE 305M), 270 Mb/s		
	SDI output		BNC x 3 (SMPTE 259M including one character out), Serial Digital (270 Mb/s)		
	Analog composite output		BNC x 3 (RS-170A, including one character out, one WFM out) Y: 1.0 Vp-p, sync negative, R-Y/B-Y: 0.7 Vp-p, 75 Ω		
	Analog component output		BNC x 3, for 1 set, 1.0 Vp-p, 75 Ω, sync negative		
	Digital audio output		BNC x 4, AES/EBU (CH 1/2, CH 3/4, CH 5/6, CH 7/8)		
	Analog audio output (CH 1/2/3/4)		XLR-3-pin type, x 5, male, +4 dBm (600 Ω load), low impedance, balanced		
	Time code output		XLR-3-pin type, male, x 1 (2.2 Vp-p, low impedance, balanced)		
	Monitor output L/R		XLR-3-pin type, male, x 2 (+4 dBm at 600 Ω load, low impedance, balanced)		
	Headphones		JM-60 Stereo phone jack (-∞ to -12 dBu at 8 Ω load, unbalanced)		
	Remote1 In		D-sub 9-pin, Sony 9-pin remote interface		
	Remote1 Out		D-sub 9-pin, Sony 9-pin remote interface		
	RS-232C		D-sub 9-pin		
	Remote2 Parallel I/O		D-sub 50-pin		
	Video control		D-sub 9-pin, D-sub 15-pin		
	Control panel		D-sub 15-pin		
	Others		"**Memory Stick**"™ slot, PCMCIA slot		
Processor adjustment range	Video level		±3 dB/∞ to +3 dB, selectable		
	Chroma level		±3 dB/∞ to +3 dB, selectable		
	Set up/black level		±3 IRE		
	Chroma phase/hue		±30°		
	System sync phase		±15 μs		
	System SC phase		±200 ns		
	Y/C delay		—	±100 ns	
Digital video performance	Sampling frequency		Y: 74.25 MHz, R-Y/B-Y: 37.125 MHz		
	Quantization		10 bit/sample (compression: 8 bit/sample)		
	Compression		Coefficient recording system		
	Channel coding		S-I-NRZI PR-IV		
	Error correction		Reed-Solomon code		
Analog component output performance	Bandwidth		Y: 0 to 5.75 MHz +0.5 dB/-2.0 dB, R-Y/B-Y: 0 to 2.75 MHz +0.5 dB/-2.0 dB		
	S/N ratio		56 dB or more		
	K Factor (2T Pulse)		1% or less		
Analog composite output performance	Bandwidth		Y: 0 to 5.75 MHz +0.5 dB/-2.0 dB, R-Y/B-Y: 0 to 2.75 MHz +0.5 dB/-2.0 dB		
	S/N ratio		53 dB or more		
	Differential gain		2% or less		
	Differential phase		2% or less		
	Y/C delay		20 ns or less		
	K Factor (2T Pulse)		1% or less		
	Output SCH phase		Based upon RS-170A/CCIR R.624-3		
Digital audio performance	Sampling frequency		48 kHz (Syncronized with video)		
	Quantization		20 bit/sample		
	Wow & flutter		Below measurable level		
	Headrooms		20 dB (or 18 dB selectable)		
	Emphasis (ON/OFF selectable in REC mode)		T1=50 μs, T2=15 μs (on/off selectable in recording mode)		
Analog audio output performance	A/D quantization		20 bit/sample		
	D/A quantization		20 bit/sample		
	Frequency response		20 Hz to 20 kHz +0.5 dB/-1.0 dB (0 dB at 1 kHz)		
	Dynamic range		More than 95 dB (at 1 kHz, emphasis ON)		
	Distortion		Less than 0.05% (at 1 kHz, emphasis ON, reference level)		
	Crosstalk		Less than -80 dB (at 1 kHz, between any two channels)		
Cue track	Sampling frequency		100 Hz to 12 kHz ±3 dB		
	S/N ratio		More than 45 dB (at 3% distortion level)		
	Distortion		Less than 2% (T.H.D. at 1 kHz, reference level)		
	Wow & flutter		Less than 0.2%		
	Erase ratio		More than 60 dB		—
Supplied accessories			Operation manual (1), Installation manual (1)		

HDW-2000 Series Specifications

			HDW-D2000	HDW-S2000/S2000P
General	Power requirements		100 to 240 V, 50/60 Hz	
	Power consumption		220 W	
	Operating temperature		+5 to +40 °C (41 to 104 °F)	
	Storage temperature		-20 to +60 °C (-4 to +140 °F)	
	Humidity		25 to 90%	
	Mass		23 kg (50 lb 11 oz)	
	Dimensions (W x H x D)		427 x 174 x 544 mm (16 7/8 x 6 7/8 x 21 1/2 inches)	
	Tape speed	HDCAM	96.7 mm/s (59.94i, 29.97PsF), 80.6 mm/s (50i, 25PsF), 77.4 mm/s (24PsF, 23.98PsF)	
		Digital BETACAM	96.7 mm/s	—
		MPEG IMX	64.5 mm/s (525/59.94), 53.8 mm (625/50)	—
		BETACAM SX	—	59.6 mm/s
		BETACAM/BETACAM SP	—	118.6 mm/s (525/59.94), 101.5 mm/s (625/50)
	HDCAM Record/playback time		124 minutes (59.94i, 29.97PsF, with BCT-124HDL cassette) 149 minutes (50i, 25PsF, with BCT-124HDL cassette) 155 minutes (24PsF, 23.98PsF, with BCT-124HDL cassette) 40 minutes (59.94i, 29.97PsF, with BCT-40HD cassette) 48 minutes (50i, 25PsF, with BCT-40HD cassette) 50 minutes (24PsF, 23.98PsF, with BCT-40HD cassette)	
	Fast forward/rewind time		Approx. 3 minutes (with BCT-124HDL cassette)	
	Search speed range	Shuttle mode		
		HDCAM	Still to ±50 times normal speed playback (59.94i, 29.97PsF), Still to ±58 times normal speed playback (50i, 25PsF), Still to ±60 times normal speed playback (24PsF, 23.98PsF)	
		Digital BETACAM	Still to ±50 times normal speed playback	—
		MPEG IMX	Still to ±78 times normal speed playback	—
		BETACAM SX	—	Still to ±78 times normal speed playback
		BETACAM/BETACAM SP	—	Still to ±35 times normal speed playback (525/59.94) Still to ±42 times normal speed playback (625/50)
		Variable mode		
		HDCAM	-1 to +2 times normal speed playback	
		Digital BETACAM	-1 to +3 times normal speed playback	—
		MPEG IMX	-1 to +3 times normal speed playback	—
		BETACAM SX		-1 to +2 times normal speed playback
		BETACAM/BETACAM SP		-1 to +3 times normal speed playback
		Jog mode	Still to ±1 times normal speed playback	
	Servo lock time		0.6 s or less (59.94i, 29.97PsF, from standby on), 0.7 s or less (50i, 25PsF, 24PsF, 23.98PsF, from standby on)	
	Load/unload time		6 s or less (both L and S cassettes)	
Input/output	HD-SDI input		BNC x 1 (SMPTE 292M), Serial Digital (1.485 Gb/s)	
	SDTI input (with optional HKDW-102 installed)		BNC x 1 (SMPTE305M), 270 Mb/s	
	Reference video input		BNC x 2 (with a loop-through), Tri-level sync, 0.6 Vp-p, 75 Ω, sync negative or Black Burst or Composite, 0.3 Vp-p, 75 Ω, sync negative	
	Digital audio input (CH 1/2, CH 3/4)		BNC x 2, AES/EBU	
	Analog audio input (CH 1/2/3/4/Cue)		XLR-3-pin type, female, x 5 Low off: -60 dBu, high impedance, balanced High off: +4 dBu, high impedance, balanced High on: -4 dBm, 600 Ω termination, balanced	
	Time code input		XLR-3-pin type, female, x 1 (0.5 to 18 Vp-p,10 kΩ, balanced)	
	HD-SDI output		BNC x 3 (SMPTE 292M including one character out), Serial Digital (1.485 Gb/s)	
	SDTI output (with optional HKDW-102 installed)		BNC x 2 (SMPTE 305M), 270 Mb/s	
	SDI output		BNC x 3 (SMPTE 259M including one character out), Serial Digital (270 Mb/s)	
	Analog composite output		BNC x 3 (RS-170A, including one character out, one WFM out) Y: 1.0 Vp-p, sync negative, R-Y/B-Y: 0.7 Vp-p, 75 Ω	
	Analog component output		BNC x 3, for 1 set, 1.0 Vp-p, 75 Ω, sync negative	
	Digital audio output		BNC x 4, AES/EBU (CH 1/2, CH 3/4, CH 5/6, CH 7/8)	BNC x 2, AES/EBU (CH 1/2, CH 3/4)
	Analog audio output (CH 1/2/3/4)		XLR-3-pin type, x 5, male, +4 dBm (600 Ω load), low impedance, balanced	
	Time code output		XLR-3-pin type, male, x 1 (2.2 Vp-p, low impedance, balanced)	
	Monitor output L/R		XLR-3-pin type, male, x 2 (+4 dBm at 600 Ω load, low impedance, balanced)	
	Headphones		JM-60 Stereo phone jack (-∞ to -12 dBu at 8 Ω load, unbalanced)	
	Remote1 In		D-sub 9-pin, Sony 9-pin remote interface	
	Remote1 Out		D-sub 9-pin, Sony 9-pin remote interface	
	RS-232C		D-sub 9-pin	
	Remote2 Parallel I/O		D-sub 50-pin	
	Video control		D-sub 9-pin, D-sub 15-pin	
	Control panel		D-sub 15-pin	
	Others		"**Memory Stick**"™ slot	
Processor adjustment range	Video level		±3 dB/∞ to +3 dB, selectable	
	Chroma level		±3 dB/∞ to +3 dB, selectable	
	Set up/black level		±3 IRE	
	Chroma phase/hue		±30°	
	System sync phase		±15 μs	
	System SC phase		±200 ns	
	Y/C delay		—	±100 ns
Digital video performance	Sampling frequency		Y: 74.25 MHz, R-Y/B-Y: 37.125 MHz	
	Quantization		10 bit/sample (compression: 8 bit/sample)	
	Compression		Coefficient recording system	
	Channel coding		S-I-NRZI PR-IV	
	Error correction		Reed-Solomon code	
Analog component output performance	Bandwidth		Y: 0 to 5.75 MHz +0.5 dB/-2.0 dB, R-Y/B-Y: 0 to 2.75 MHz +0.5 dB/-2.0 dB	
	S/N ratio		56 dB or more	
	K Factor (2T Pulse)		1% or less	
Analog composite output performance	Bandwidth		Y: 0 to 5.75 MHz +0.5 dB/-2.0 dB, R-Y/B-Y: 0 to 2.75 MHz +0.5 dB/-2.0 dB	
	S/N ratio		53 dB or more	
	Differential gain		2% or less	
	Differential phase		2% or less	
	Y/C delay		20 ns or less	
	K Factor (2T Pulse)		1% or less	
	Output SCH phase		Based upon RS-170A/CCIR R.624-3	
Digital audio performance	Sampling frequency		48 kHz (Syncronized with video)	
	Quantization		20 bit/sample	
	Wow & flutter		Below measurable level	
	Headrooms		20 dB (or 18 dB selectable)	
	Emphasis (ON/OFF selectable in REC mode)		T1=50 μs, T2=15 μs (on/off selectable in recording mode)	
Analog audio output performance	A/D quantization		20 bit/sample	
	D/A quantization		20 bit/sample	
	Frequency response		20 Hz to 20 kHz +0.5 dB/-1.0 dB (0 dB at 1 kHz)	
	Dynamic range		More than 95 dB (at 1 kHz, emphasis ON)	
	Distortion		Less than 0.05% (at 1 kHz, emphasis ON, reference level)	
	Crosstalk		Less than -80 dB (at 1 kHz, between any two channels)	
Cue track	Sampling frequency		100 Hz to 12 kHz ±3 dB	
	S/N ratio		More than 45 dB (at 3% distortion level)	
	Distortion		Less than 2% (T.H.D. at 1 kHz, reference level)	
	Wow & flutter		Less than 0.2%	
	Erase ratio		More than 60 dB	
Supplied accessories			Operation manual (1), Installation manual (1)	

HDW-2000 Series Specifications

Digital BETACAM playback (HDW-M2000/M2000P, HDW-M2100/M2100P, HDW-D2000)

Video performance	Bandwidth	Y	0 to 5.75 MHz +0.5 dB/-0.5 dB
		R-Y/B-Y	0 to 2.75 MHz +0.5 dB/-0.5 dB
	S/N ratio		62 dB or more
	K factor		1% or more
Digital audio (CH 1 to CH 4)	Frequency response (0 dB at 1 kHz)		20 Hz to 20 kHz +0.5 dB/-1.0 dB
	Dynamic range		95 dB (at 1 kHz, emphasis ON)
	Distortion (T.H.D. at 1 kHz, reference level)		0.05% rms (emphasis ON)
	Wow & flutter		Below measurable level
Analog audio (cue track)	Frequency response (0 dB at 1 kHz)		100 Hz to 12 kHz +3 dB/-3 dB
	S/N ratio (at 3% distortion level)		45 dB (at 1 kHz)
	Distortion (T.H.D. at 1 kHz, reference level)		2% or less
	Wow & flutter		HDW-M2000/M2100/D2000: Less than 0.5% rms HDW-M2000P/M2100P/D2000: Less than 0.2% (DIN 45508 weighted)

MPEG IMX playback(HDW-M2000/M2000P, HDW-M2100/M2100P, HDW-D2000)

Video performance	Bandwidth	Y	0 to 5.75 MHz +0.5 dB/-2.0 dB
		R-Y/B-Y	0 to 2.75 MHz +0.5 dB/-2.0 dB
	S/N ratio		56 dB or more
	K factor (2T pulse)		1% or less
Audio perfomance	Frequency response		20 Hz to 20 kHz +0.5 dB/-1.0 dB (0 dB at 1 kHz)
	Dynamic range		90 dB or more (at 1 kHz, emphasis ON, 16 bits/48 kHz)
	Distortion		0.05% or less (at 1 kHz, emphasis ON, reference level (+4 dBm))

BETACAM SX playback (HDW-M2000/M2000P, HDW-M2100/M2100P, HDW-S2000/S2000P)

Video performance	Bandwidth	Y	HDW-M2000/M2100/S2000: 0 to 4.5 MHz +0.5 dB/-3.0 dB HDW-M2000P/M2100P/S2000P: 0 to 5.5 MHz +0.5 dB/-3.0 dB
		R-Y/B-Y	0 to 2.0 MHz +0.5 dB/-3.0 dB
	S/N ratio		56 dB or more
	K factor (2T pulse)		1% or less
Audio perfomance	Frequency response		20 Hz to 20 kHz +0.5 dB/-1.0 dB (0 dB at 1 kHz)
	Dynamic range		90 dB or more (at 1 kHz, emphasis ON)
	Distortion		0.05% or less (at 1 kHz, emphasis ON, reference level (+4 dBm))

Analog BETACAM playback (HDW-M2000, HDW-M2100, HDW-S2000)

			Metal tape	Oxide tape
Video performance	Bandwidth	Y	30 Hz to 4.5 MHz +0.5 dB/-4.0 dB	30 Hz to 4.1 MHz +0.5 dB/-6.0 dB
		R-Y/B-Y	30 Hz to 1.5 MHz +0.5 dB/-3.0 dB	30 Hz to 1.5 MHz +0.5 dB/-3.0 dB
	S/N ratio	Y	51 dB or more	48 dB or more
		R-Y/B-Y	48 dB or more	45 dB or more
	K-Factor (2T Pulse)		2% or less	3% or less
	LF non-linearity	Y	3% or less	
		R-Y/B-Y	4% or less	
	Y/C delay		20 ns or less	
Audio performance	LNG	Frequency responmse	50 Hz to15 kHz +1.5 dB/-3.0 dB	50 Hz to15 kHz +1.5 dB/-3.0 dB
		S/N ratio	72 dB or more	50 dB or more (Dolby NR off)
		T.H.D.	1% or less	2% or less
		Wow & Flutter	0.1% rms or less	
	AFM*	Frequency response	20 Hz to 20 kHz +0.5 dB/-2.0 dB	
		S/N ratio	85 dB or more	
		T.H.D.	0.5% or less	

* The HDW-S2000 does not support AFM playback.

Analog BETACAM playback (HDW-M2000P, HDW-M2100P, HDW-S2000P)

			Metal tape	Oxide tape
Video performance	Bandwidth	Y	25 Hz to 5.5 MHz +0.5 dB/-4.0 dB	25 Hz to 4.0 MHz +0.5 dB/-6.0 dB
		R-Y/B-Y	25 Hz to 2.0 MHz +0.5 dB/-3.0 dB	25 Hz to 1.5 MHz +0.5 dB/-3.0 dB
	S/N ratio	Y	48 dB or more	46 dB or more
		R-Y/B-Y	48 dB or more	45 dB or more
	K-Factor (2T Pulse)		2% or less	3% or less
	LF non-linearity	Y	3% or less	
		R-Y/B-Y	4% or less	
	Y/C delay		20 ns or less	
Audio performance	LNG	Frequency responmse	50 Hz to 15 kHz +1.5 dB/-3.0 dB	50 Hz to15 kHz ±3.0 dB
		S/N ratio	68 dB or more	62 dB or more (Dolby NR off)
		T.H.D.	1% or less	2% or less
		Wow & Flutter	0.1% rms or less	
	AFM*	Frequency response	20 Hz to 20 kHz +0.5 dB/-2.0 dB	
		S/N ratio	More than 72 dB (CCIR 468-3 weighted)	
		T.H.D.	Less than 0.5%	

* The HDW-S2000P does not support AFM playback.

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